REMARKS

In the Office Action, the Examiner rejected claims 1, 2, 4-8, 11, 12, 14-20, 22, and 24 pursuant to 35 U.S.C. § 103(a) as unpatentable over Leavitt, et al. (U.S. Patent No. 6,491,634). Claim 9 was rejected pursuant to 35 U.S.C. § 103(a) as being unpatentable over Leavitt, et al. in view of Little, et al. (US 2004/0133110). Claims 10 and 13 were rejected pursuant to 35 U.S.C. § 103(a) as being unpatentable over Leavitt, et al. in view of Pflugrath, et al. (U.S. Patent No. 6,102,863). Claim 23 was rejected pursuant to 35 U.S.C. § 103(a) as being unpatentable over Leavitt, et al. in view of Pflugrath, et al. and further in view of Ramirez (US 5,627,536).

Applicants respectfully request reconsideration of the rejections of claims 1-2, 4-20, and 22-24, including independent claims 1, 11, 16 and 20.

Independent claim 1 recites an analog-to-digital converter between the transducer and the releaseable connector where a cable connects the ultrasound transducer to the analog-to-digital converter and a housing connects with the end of the cable and is at least partially around the releasable connector and the analog-to-digital converter.

Leavitt, et al. do not disclose these limitations. Leavitt, et al. provide an ultrasound system 102 connected via a cable 104 to a probe assembly 106 (col. 3, lines 31-35; and Figure 1). Both the transducer 202 and the analog-to-digital converters 214 are in the probe assembly 106 (col. 3, line 62-col. 4, line 3; col. 4, lines 22-31; Figures 1 and 2). The analog-to-digital converters 214 are part of electronics in the probe assembly 106 to reduce the number of signals to be communicated over the cable 104 to the ultrasound system 102 (col. 3, lines 42-52; and col. 4, lines 53-56). Leavitt, et al. provide a probe assembly with analog-to-digital converters, shown in one housing (Figures 1 and 2), where the cables connect from the probe housing 106 to the ultrasound system 102. Leavitt, et al. teach the transducer, analog-to-digital converter, cable, and cable releasable connector in a different order than claimed. Leavitt, et al. do not provide for a connector housing covering at least part of both

the releasable connector and the analog-to-digital converter where a cable connects the ultrasound transducer to the analog-to-digital converter.

The Examiner notes that a change in shape, portability, and separability do not render an application novel. In particular, the cables are alleged to constitute only the electrical connection, and the portions of the housing around the transducer and the A/D converter/connector can be considered separate from the imaging system housing as they are electrically connected in the Figures as separate portions of the schematic.

The separate blocks of the schematic of Figure 2 are shown in a same box 106 labeled as a probe (Figure 2). The probe 106 is a single housing, as represented in Figure 1, and known in the art. The probe 106 includes parts that are assembled together, being noted as an assembly in the specification (col. 3, lines 33-40). The probe 106 is held by the user to scan a patient, so would not be separated by a person of ordinary skill in the art. Separation would cause ergonomic problems due to the number of cables. The cables used for these signals are coaxial cables. Since an array is used, many coaxial cables result. Coaxial cables are heavy, so a fewer number are sought (col. 1, lines 37-41). A person of ordinary skill in the art would not have added cables between the components to avoid the weight.

The analog-to-digital converters 214 are next to the transducers 202 to allow sub-beamformation, which reduces the number of cables to be used (col. 3, lines 49-52 and col. 4, lines 53-56). Separating the analog-to-digital converters 214 from the transducers 202 by cables instead of circuit board signal traces would defeat the very purpose for the position of the analog-to-digital converters 214 in the probe 106. A person of ordinary skill in the art would not have used cables between the components within the probe 106 to form separately housed devices. This would not have been ergonomic (more cables leading to more weight) and would be contrary to the attempt to reduce the cables taught by Leavitt, et al.

This is not a case of simple change in shape, portability or separability. The arrangement shown by Leavitt, et al. exists for good reason according to Leavitt, et al. The separation proposed by the Examiner as obvious would result in the very problems Leavitt, et

al. seek to avoid. A person of ordinary skill in the art would not have used cables between the components of the probe 106.

Independent claim 11 recites a detachable transducer assembly with an analog-to-digital converter in a connector housing, which is physically detachable from a connector on the system housing. As discussed above for claim 1, Leavitt, et al. position the analog-to-digital converter in the transducer housing, not in the connector housing with a cable between the connector housing and the transducer probe. It would not have been obvious to separate the analog-to-digital converters 214 from the transducers 202 with cables. Such separation would defeat minimization of cables from the probe 106 since the reduction does not occur until after the analog-to-digital converters.

Independent claim 16 recites a processor connected between the transducer and releasable connector and in the housing of the releasable connector. As discussed above for claim 1, Leavitt, et al. disclose positioning the processing in the transducer housing, and then connecting the transducer housing to the imaging system with an interface cable (see col. 3, lines 37-52). Leavitt, et al. do not position any processor in the housing of the releasable connector. It would not have been obvious to position a processor in the releasable connector housing as the processing of the probe 106 has the goal of reducing channels and that goal is achieved by the components within the probe 106. Moving any of those components to the connector housing would result in no reduction of channels and a substantial increase in the number of cables, the very thing sought to be avoided by Leavitt, et al. A person of ordinary skill would not have positioned a processor in the housing of the releasable connector due to the signal reduction teachings in order to provide fewer interconnects as taught by Leavitt, et al.

Independent claim 20 has been amended to include the limitations of claim 21. In particular, claim 20 recites transmitting electrical signals through a cable of the probe assembly and converting the electrical signals into digital data within a connector housing of the probe assembly. Claim 20 is allowable for the same reasons as claim 1.

Dependent claims 2, 4-10, 12-15, 17-19 and 22-24 each depend from one of the independent claims above, so is each allowable for at least the same reasons as the corresponding base claim. Further limitations distinguish from the cited references.

Claim 5 recites cables connecting transducer elements to analog-to-digital converters. Leavitt, et al. use cables between the probe assembly 106 and the imaging system 102. The elements and the analog-to-digital converters are on the same end (probe assembly 106) of the cables. The analog-to-digital converters are before the sub-beamformer, so are before reduction of the signals. A person of ordinary skill in the art would not have positioned the cables between the elements and the analog-to-digital converters as increased weight from the larger number of cables would result.

Claim 8 recites a digital processor between the analog-to-digital converter and the electrical outputs. Since the analog-to-digital converter is in the connector housing, Leavitt, et al. do not suggest this placement.

Claim 9 recites a switch between the ultrasound transducer and the analog-to-digital converter to bypass analog signals. Leavitt, et al. provide an alternative of an analog sub-beamformer (col. 11, lines 5-8). This embodiment would not even have the analog-to-digital converter and would not provide for a bypass. The T/R switch of col. 3, line 60-col. 4, line 20 is a known component for protecting sensitive receive circuits from high voltage transmit circuits, so blocks transmit signals from receive circuits. The T/R switch does not bypass analog signals to the outputs.

Claim 13 recites a combination of a multiplexer and demultiplexer where the demultiplexer is in the connector housing. Pflugrath, et al. multiplex and demultiplex to route signals from elements to different beamformer channels. The demultiplexer is not located in the connector housing, but instead in the probe housing. The dumultiplexer could not be located in the connector housing as the demultiplexer is used to protect the receive circuits from the transmit voltage, so is immediately adjacent to the elements of the transducer.

Claim 14 recites a serializer housed by the connector housing. The Examiner cites to delay and focus components in the probe assembly, not the connector housing. The delay and focus components are not serializers.

Claim 15 recites a processor in the connector housing. Claim 15 is allowable for similar reasons as claim 16.

Claim 17 is allowable for similar reasons as claim 1.

Claim 23 recites time division multiplexing signals prior to transmission to the analog-to-digital converter and then demultiplexing the signals after converting and before passing. Pflugrath, et al. use multiplexing and demultiplexing for routing to beamformer channels to protect receive circuits from transmit voltage, so do not disclose the recited demultiplexing after ADC.

CONCLUSION:

Applicants respectfully submit that all of the pending claims are in condition for allowance and seeks early allowance thereof.

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Date: June 23, 2009